

REMARKS

Applicants have canceled claims 1-9. Applicants have amended claims 10, 21, 36, and 43. No new matter has been added by this amendment.

Applicants acknowledge that the Examiner has allowed claims 29-32, 34, and 35.

Claim Rejections – 35 U.S.C. § 103(a)

The Examiner has rejected claims 1-3, 5-13, 15-17, 21, 23, 24, 26-28, and 36-53 under 35 U.S.C §103(a) as being unpatentable over Pramanick (U.S. Patent 6,054,398) in view of Agnello et al. (U.S. Patent 6,255,217). Applicants respectfully submit that claims 10-13, 15-17, 21, 23, 24, 26-28, and 36-53, are not rendered obvious by Pramanick and Agnello et al. because the references do not teach or suggest every element of these claims.

Regarding independent claims 10, 21, 36, and 43, Applicants teach and claim a method for forming a dielectric, which includes forming a fluorine containing film on a substrate and exposing the film to a reducing plasma to form a fluorine depleted top surface and fluorine depleted sidewalls. A layer of conductive material is formed over the fluorine depleted sidewalls. An etch stop layer is formed over the fluorine depleted top surface. The etch stop layer may exhibit improved adhesion characteristics over a fluorine depleted surface as compared to non-depleted surface. (Page 8, lines 20-27)

Pramanick discloses forming a damascene opening prior to performing the plasma pretreatment. (Col. 4, lines 20-60; Fig. 3) The surfaces of the via and channel dielectric layers 216, 208 are defluorinated in order to provide an adhesion/barrier layer surface 223 for the subsequent deposition of tantalum. (Col. 4, line 60) After tantalum layer 224 is deposited on the adhesion/barrier layer, seed layer 228 is deposited, and a second conductive material is formed on top of the seed layer to fill the via and channel. Finally, Pramanick discloses the use of a chemical-mechanical polishing process to expose the fluorinated

second channel dielectric for further processing. (Col. 5, lines 10-30) Pramanick does not teach forming an etch stop layer on the top surface of the fluorine depleted surface. As illustrated in Figure 3 of Pramanick, nitride hardmask layers (114, 117) are formed on the dielectric layers prior to exposing the fluorinated dielectric to the reducing plasma. Thus, the nitride hardmask layers of Pramanick are not formed on a fluorine depleted surface.

Agnello et al. discloses a method of improving the adhesion of an inorganic deposited barrier film on copper surfaces present in interconnect semiconductor structures. (Col. 3, lines 5-8) Agnello et al. uses a reducing plasma on the copper interconnect structure in order to improve adhesion between the copper interconnect structure and the barrier layer 24. (Col. 4, lines 10-12, 53-58) Agnello et al. does not teach a fluorine depleted top surface or fluorine depleted sidewalls. Moreover, Agnello et al. does not teach that a layer of conductive material is formed over fluorine depleted sidewalls. Agnello et al. teaches away from forming a layer of conductive material over the fluorine depleted surface, because the conductive material of Agnello et al. is formed and subsequently exposed to a reducing plasma. Pramanick discloses that tantalum is deposited on the fluorine depleted sidewalls, followed by a second conductive material, such as copper. Thus, the method taught by Agnello et al. is incompatible with that taught by Pramanick. One skilled in the art would not be inclined to combine the methods disclosed by these references.

Neither Pramanick nor Agnello et al. disclose the formation of an etch stop layer over a fluorine depleted top surface as well as the formation of a conductive layer over fluorine depleted sidewalls. Moreover, one skilled in the art would not use the method disclosed by Agnello et al. in conjunction with that disclosed by Pramanick. Therefore, Applicants respectfully submit that Pramanick and Agnello et al., independently or in combination, do

not render independent claims 10, 21, 36, and 43 obvious, because the references do not teach or suggest every element of these claims.

Claims 11-13, 15-17, 23, 24, 26-28, 37-41, and 44-48 are dependent upon claims 10, 21, 36, and 43 respectively. Thus, for at least the same reasons advanced above with respect to independent claims 10, 21, 36, and 43, Applicants respectfully submit that Pramanick and Agnello et al., independently or in combination, do not render these claims obvious.

In view of the foregoing remarks, Applicants respectfully request the withdrawal of the 35 U.S.C. 103(a) rejection of claims 10-13, 15-17, 21, 23, 24, 26-28, and 36-53, and requests an allowance of these claims. If there are any additional charges, please charge Deposit Account No 02-2666.

Respectfully submitted,

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